VACATION NOTES.

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I. Notes on the Californian Flora.

During the past summer my vacation was spent in visiting various parts of the Pacific Coast, my travels extending as far north as Skagway. While it must be admitted that the various trips made were intended primarily for recreation, rather than for scientific purposes, still a botanist could not fail to be deeply interested in the rich and striking flora of our western possessions, and I have tried here to jot down some of the impressions made upon me in my wanderings over this most picturesque part of our country.

It is hardly necessary to remind the botanist how very marked are the differences between the floras of the Atlantic and Pacific regions of the United States, especially in the more southern parts. The topography of the Pacific slope, with the lofty Sierra extending practically without a break from Alaska to Mexico, produces climatic conditions very different from those of the Atlantic States. The differences in climate, together with other factors affecting the origin and distribution of the western plants, have resulted in a flora which makes most of California seem very unfamiliar to the eastern botanist.

The Santa Clara Valley, in which Stanford University is situated, is thoroughly representative of middle California. This is the great fruit region of the state, and the level floor of the valley and lower foothills are largely given up to orchards of prunes, apricots, and peaches, while extensive vineyards are also planted, and large quantities of wine are made in some sections of the valley.

The valley opens at the north upon a long extension of San Francisco Bay, and here the extreme width of the valley is perhaps fifteen miles, narrowing rapidly as we go south. To

the east lies the Mt. Hamilton or inner coast range, with Mt. Hamilton, some 4500 feet above sea level, as its highest point. To the west rise the densely wooded Santa Cruz mountains, somewhat lower than the eastern range, and separating the valley from the ocean.

The floor of the valley and the rolling foothills are covered with spreading oaks, which in places form extensive groves, which can hardly be dignified with the name of forests. The scattered groups of oaks give a park-like aspect to the landscape which is most attractive. The prevailing species are the live oak (*Quercus agrifolia*) and the white oak (*Q. lobata*). Along the water-courses and roadsides there is a dense growth of shrubs, the remains of the "chaparral" or thickets which originally covered much of the valley. The chaparral is composed of a variety of shrubs and small trees, among which may be mentioned the Californian buckeye (*Æsculus californica*), Bigelovia, *Rhamnus californicus*, poison oak (*Rhus diversiloba*), toyon (*Heteromeles arbutifolia*), and elder (*Sambucus glauca*), the latter a very characteristic species with glaucous berries, and forming a small tree of 15 to 20 feet in height.

Along the water-courses and in the moist canyons leading into the valley are various trees, but none of very large size. Besides the species of willows and poplars, alders, becoming trees 50 to 60 feet high, are common; and with these are a number of trees less familiar to the eastern botanist. The beautiful bay tree (*Umbellularia californica*) is abundant, and the equally striking Madrõno (*Arbutus menziesii*), with its smooth cinnamon-red branches and magnolia-like evergreen leaves, is decidedly novel in appearance. The Oregon maple (*Acer macrophyllum*) is also a conspicuous tree of this region. An occasional redwood (*Sequoia sempervirens*) is sometimes found along the banks of the streams several miles away from the base of the mountains, but it is in the sheltered canyons higher up that this monarch of the coast ranges reaches its full development.

The common flowers of the valley are the characteristic ones of the central Californian region, and are, for the most part, of southern origin. Many leguminous plants, especially pecul-

iar species of Trifolium, Lupinus, and Hosackia, abound; and early in the spring the grassy meadows and hillsides are often covered with masses of these flowers as well as many others. Species of Nemophila and Phacelia represent the Hydrophyllaceæ, while the Borraginaceæ include species of Amsinckia and Erytrichium, which, although the flowers are small, occur in immense quantities, and are thus very conspicuous. Unfamiliar Scrophulariaceæ, like Orthocarpus, Mimulus, and Collinsia, and the showy poppies, Eschscholtzia, Mecanopsis, and Platystemon, are all very different from their eastern relatives. Many beautiful liliaceous plants also occur in great profusion. The most striking of these belong to the western genera Calochortus — the beautiful Mariposa lilies — and Brodiæa; while higher up among the redwoods are the more northern genera, Fritillaria, Erythronium, and Trillium. In the open sunny valleys these vividly colored flowers often occur in great masses, and form veritable carpets of bloom that it would be hard to equal anywhere.

Later in the season appear hosts of low-growing Compositæ, and on the barren hillsides we may look for the showy Onagraceæ, so abundant in Pacific North America. Besides the familiar Epilobium and Œnothera, there abound species of Godetia and Clarkia, and late in the summer the scarlet fuchsia-like Zauschneria.

With the cessation of the rains, which may occur any time after the first of April, the flowers mostly disappear, and the hillsides assume their summer dress of golden brown until the autumn rains start the seeds into growth again.

Last year was an exceptionally dry one, and when I left San Francisco, about the first of June, the surrounding country was already dry and dusty, and scarcely a trace of the spring verdure could be seen anywhere.

I had engaged passage for Sitka from Tacoma on June 19, but decided to spend the interval at some point in Northern California, which, except for such glimpses as one can get passing through on the railroad, was a new country to me. My destination was Castle Crag, one of the many charming spots in the beautiful mountain region of the north. It lies about 2000 feet above sea level within twenty miles of the base of

Shasta, the most beautiful, if not the highest, of the mountains of California. The view of the glorious snow-covered peak, over 14,000 feet high, is one never to be forgotten. The great pyramid rises from a vast plain, with nothing to break the long, smooth sweep of the slopes of its symmetrical cone. Seen from Castle Crag, the mountain is peculiarly impressive, and its snowy cone, framed by giant pines, is a sight, once seen, to be remembered for a lifetime.

The general aspect of the country about Castle Crag is very different from that of the more southern valley regions. Here the railroad follows the narrow gorge of the upper Sacramento, and on each side the steep, heavily forested mountains rise, the only level ground being little meadows nestled between the bases of the hills or forming a narrow margin to the streams. The rains had not yet ceased, and the vegetation was in the full luxuriance of early summer — a sharp contrast to the dusty sunburned aspect of the lower valleys.

The magnificent forest here has been carefully protected, and gives one a good idea of the character of the virgin forest of the northern mountains. The prevailing trees are the sugar pine (*Pinus lambertiana*), yellow pine (*P. ponderosa*), white fir (*Abies sp.*?), and Douglas spruce (*Pseudotsuga douglasii*). In the low ground near the streams the yew (*Taxus brevifolia*) was not uncommon, but this does not, in this region at least, form a tree of any size. Along the streams, and forming an undergrowth in the lower forest region, are numerous deciduous trees and shrubs, most of them northern types, and often nearly related to eastern species.

None of the deciduous trees attain a large size, but further north some of them, like the big-leaved maple (*Acer macrophyllum*) and ash (*Fraxinus oregana*), become valuable timber trees. Alders and willows along the streams, and several oaks, the pretty vine-leaved maple (*Acer circinnatum*), and flowering dogwood, are the commonest constituents of the arborescent undergrowth. With these are mingled many fine flowering shrubs which add much to the beauty of the forest. The dogwood (*Cornus nuttallii*), which is said to be even more beautiful than the eastern species, was nearly past, but to judge from the

remains of the large inflorescences, which much exceed in size those of *C. florida*, this may well be true. By far the most beautiful of the flowering shrubs, at the time of my visit, was the exquisite azalea (*Rhododendron occidentale*), which formed extensive thickets covered with masses of the lovely pink and white fragrant flowers. It is not unlike *R. viscosum*, but is much finer than that species. Calycanthus and Philadelphus were seen along the railroad, but were not noted in the immediate neighborhood. Wild roses were abundant, and the thimbleberry (*Rubus nutkanus*), with its big maple leaves and showy white flowers, was very common, as it is throughout the whole of Pacific North America, from the mountains of middle California to Alaska, and east to Lake Superior, where I remember to have seen it for the first time many years ago.

The abundant moisture of the lower forests and the numerous streams at their bases are favorable to the development of a rich herbaceous flora, among which we find many beautiful flowers. The spring flowers, like the Fritillarias and Erythroniums, and the early violets, were gone, but the early summer flowers were abundant. Most of these belonged to familiar genera, and the species were not infrequently allied to eastern ones. *Dicentra formosa*, much like the eastern *D. eximia*, was very common, and *Aquilegia truncata*, differing but little from *A. canadensis*, was frequent. Carpeting the floor of the forest were two or three species of Asarum, one with beautifully reticulated leaves, and several species of Pyrola, among them the curious *P. aphylla*, were common. Above the thickets of brakes in the low ground, the gay flowers of *Lilium pardalinum* were to be seen, recalling the brighter forms of *L. superbum*.

Orchids, which are rare in California, were represented by several striking species. Two Cypripediums, *C. montanum*, much like a white-lipped *C. pubescens*, and *C. californicum*, with smaller flowers, were met with, but both are rare plants. A Habenaria with inconspicuous flowers, and the very striking and peculiar *Cephalanthera oregana* were the two commonest orchids. The latter was frequent in the shady woods, where its ivory-white stems and flowers, the latter with a touch of yellow on the lip, were very conspicuous.

Everywhere along the streams were clumps of the giant peltate leaves of *Saxifraga peltata*, one of the most striking plants of the Californian mountains.

The natural meadows are a marked feature of this region. The absence of protracted drought permits the growth of perennial grasses and other meadow plants. White and red clover have become naturalized, and various Compositæ, like Rudbeckia and Erigeron, mixed with these, gave the meadows a very familiar aspect, although purple and white Brodiæas and some other western plants were mingled with them.

Perhaps the most interesting plant met with near Castle Crag was the curious Darlingtonia — the Californian pitcher plant, which I saw growing for the first time. It occurs abundantly at several points near Castle Crag, but we found it in greatest perfection on a steep hillside sloping to the Sacramento. There are no peat bogs in this region such as harbor our eastern Sarracenias, but the plants were growing in the boggy ground made by the damming of a little stream which flowed down the hillside into the river. Here in the bed of the brook were growing dense clumps of the tall light-green trumpets of the Darlingtonia. Some of these were quite two feet in height, and their vivid apple-green hoods were extremely conspicuous. Here and there the greenish-yellow Sarracenia-like flowers nodded on tall stalks above the leaves, or were replaced by the oval green seed-vessels. Darlingtonia recalls the tall southern species of Sarracenia like *S. variolaris*, with which it agrees in the presence of the translucent spots in the hood, as well as the form of the pitcher. It is much less like *S. purpurea*, which is its nearest neighbor among the Sarracenias. It would be interesting to know how this curious plant has become stranded high up in the Sierra Nevada, so far away from its eastern relations.

While ferns were numerous in some localities, the number of species was not great, nor were mosses as abundant as might have been expected. Aside from the ubiquitous *Pteris aquilina*, the most noticeable ferns were *Adiantum pedatum* and *Woodwardia radicans*, both of which attain great perfection on the shady hillsides, although neither can be said to be very common.

In the moist thickets and meadows, four species of Equisetum were noted — all, so far as I know, that have yet been noted for the state, except *E. hiemale*, whose occurrence here is doubtful. The two large species of the region of San Francisco, *E. robustum* and *E. maximum*, were abundant, and *E. arvense* and *E. lævigatum*, which are apparently confined to the mountain districts, were not uncommon.

Two points in the neighborhood, the granite crags, from which it takes its name, and Cragview Summit, each about 6000 feet above sea level, are easily reached, and their upper regions, which are much more arid than the lower forest, have a very different flora. As we ascend, the dense undergrowth of deciduous shrubs disappears, and the floor of the forest is but scantily covered with vegetation. On the exposed summits the trees either disappear or are much stunted, although the true timber line is considerably higher in more sheltered situations.

On the dry hill slopes there is the usual growth of chaparral, made up largely of species of Ceanothus, one of which (*C. thyrsiflorus*), was covered with heavy-scented blue flowers, known popularly as "California lilac." The densely matted thorny stems of the Ceanothus make at times an almost impassable thicket. In the higher regions several evergreen shrubs formed part of the chaparral. Of these the most conspicuous were the dwarf chestnut (Castanopsis) and manzanita (Arctostaphylos).

Many beautiful flowers grow in these dry regions. Chief of these is the beautiful white lily (*Lilium washingtonianum*), known locally as the Shasta lily. It is very common, and its straight stem and regular whorls of undulate leaves were seen on all sides rising above the low chaparral. Most of them were in bud, but only a few were seen in flower, as they are not in full bloom before the end of June. This beautiful lily is quite different from any of our eastern species, and the form of the flower, as well as the odor, recall the magnificent Japanese *L. auratum*, although the flowers are very much smaller.

Other showy flowers noted were the scarlet *Delphinium nudicaule*, *Iris macrosiphon*, *Calochortus maweanus*, species of Castilleia, Godetia, Pentstemon, and the curious *Spraguea umbellata*, a characteristic plant of the higher Sierra. *Symphoricarpus sp.?*

and *Smilacina amplexicaulis*, much like *S. racemosa*, were also noticed, and in places, *Veratrum californicum*, with its great plaited leaves, was very conspicuous.

A second trip was made later in the summer to the higher Sierra of central California. My destination was Lake Tahoe, that beautiful mountain lake lying over 6000 feet above the sea, on the boundary between California and Nevada. It lies on the eastern slope of the mountains, and the surrounding country is much more arid than the western slope of the Sierra. The lake is very deep — over 1600 feet in places — and the waters are marvelously clear and of an intense sapphire blue, such as I have never seen elsewhere except in tropical seas. Very little vegetation exists in the lake itself, and only in a few places are the shores at all marshy.

The past summer was an exceptionally dry one, and I must confess to a feeling of disappointment in the flora of the surrounding country, which was nearly everywhere dry and dusty.

Where the shores of the lake have been undisturbed there is a good growth of trees, some of quite large size. Some of the yellow pines were about 150 feet high and five feet in diameter, but the trees do not attain the dimensions of those in the great forest belt on the western slopes of the mountains. In most places the timber has been cut, and the shores present a miserable appearance. Besides the yellow pine, there is some sugar pine and tamarack (*Pinus contorta*, var. *murryana*), and the incense cedar (Libocedrus) and several firs are also not uncommon.

The growing season is very short, and the trees must grow very slowly, to judge from stumps which were examined. This is especially true of the cedars. A stump, perhaps five feet in diameter, showed over 700 growth rings, and doubtless some of the largest trees were at least 1000 years old. The pines grow much more rapidly, none of the yellow pines examined being over 300 years old.

Among the trees there is little undergrowth, but the exposed places and the hillsides are covered with an impenetrable thicket of Ceanothus, manzanita, and dwarf chestnut, with a sprinkling of other shrubs.

The most beautiful part of the lake is the southern end, where there are extensive meadows and apparently more moisture than in the other parts of the shore. Here also are the highest mountains, rising from 4000 to 5000 feet above the lake. Here were found the only marshes seen about the lake. At one point a small stream enters the lake, flowing through level meadows and forming small marshes in which a number of interesting aquatic plants were observed. These included a number of interesting algæ, as well as Utricularia, Potomogeton, Nuphar, Sparganium, and others not noted elsewhere.

In ordinary years it is said that snow lies on several of the peaks for most of the summer, but last year, in August, there were merely a few small patches on Mt. Tallac, the most accessible of the higher peaks.

My first stopping-place was at "McKinney's," on the west shore of the lake, and from here a number of excursions were made in various directions. The shores of the lake at this point are low, and the forest comes down to the water's edge. As we have already indicated, the forest is composed entirely of Conifers, but along the streams, and in a few places on the hillsides, are small groves of willows, alders, and poplars which, however, are never of large size. The sandy soil between the trees was covered in spots with low-spreading mats of Ceanothus and Arctostaphylos, but was often quite bare. Flowers were scarce, but there were a few showy ones, the most striking being a brilliant blue Pentstemon, scarlet Castilleicas, two or three Gilias with scarlet and flesh-colored flowers, and the big sunflower-like Wyethias.

In the shelter of the denser woods, away from the lake, were other plants which needed more shade. A dwarf form of *Rubus nutkanus* was common, and species of Pyrola and Chimaphila, as well as two orchids, *Goodyera menziesii* and *Corallorhiza sp.?* were found here. At a number of places the withered remains of the curious snow-plant (*Sarcodes sanguinea*) were seen, but its season was past.

At the extreme southern end and on the western shore, the shores become more arid, and the growth of trees is scattering.

The open ground and the lower hills are covered with sage-

brush and other plants characteristic of the Nevada deserts, and the vegetation is thus intermediate to some extent between the desert flora of the Great Basin and the mountain flora of the Sierra Nevada.

The higher altitudes show a more or less pronounced alpine flora, which was seen to best advantage when making the ascent of Mt. Tallac, whose summit is nearly 10,000 feet above sea level. At the wind-swept summit the characteristic alpine white pine (*Pinus albicaulis*) at once attracted attention. The gnarled trunk, with smooth light-gray bark, and the twisted branches were beaten flat upon the ground in the more exposed situations. This well-marked species is one of the most striking of the numerous Conifers of the Sierra. A little lower down a juniper — probably *J. occidentalis* — was noticed, a tree of perhaps 30 to 40 feet in height, with massive trunk and branches. In sheltered hollows near the summit, beds of arnica were blooming, and among the flowers were swarms of bees and butterflies which had been attracted to these high altitudes. Of the flowers encountered on the way up, the most striking was a beautiful blue gentian, probably *G. calycosa*. Other plants noted were *Aconitum Fischeri*, a tall blue larkspur (*Delphinium scopulorum?*), and the heath-like *Bryanthus breweri*, the latter unfortunately past flower, but said to be one of the most beautiful alpine plants of the Sierra.

The Washington lily is very abundant about Lake Tahoe, where it reaches its finest development. Specimens four or five feet high are common, and in favorable seasons it is said that specimens seven feet high, with twenty or thirty flowers on a stem, are sometimes found. The pretty little tiger lily (*L. parvum*) is not at all rare in moist ground, where the stems sometimes carry a dozen or more of their graceful bells.

No attempt has been made in this hasty sketch to give a full list of the plants of the regions visited; this is obviously impracticable. Such have been selected for illustration as seemed to emphasize the peculiar characters of the districts, and such as would naturally attract the attention of the casual visitor.

No region of equal area in our country offers such great range of conditions as does California, and, as naturally might

be expected, this is reflected in its remarkably rich and interesting flora, which offers a most attractive field to the student of geographical distribution of plants. The state extends over ten degrees of latitude, with a coast line of over 1000 miles, and its highest mountains rise 15,000 feet above sea level. There are regions like the Mojave desert and Death valley which are absolute deserts, while in the northern coast ranges there are points where the annual rainfall probably exceeds 100 inches, and the forests of giant redwoods rival the jungles of the tropics in the rank luxuriance of their vegetation.

The great barrier of the Sierra Nevada and the even temperature of the ocean waters, due to the Japan current, combine to give the whole state a far more equable climate than is found elsewhere in the United States; and in the lowlands, winter, as we know it in the eastern states, does not exist, but instead the year is divided into two sharply marked seasons, the wet and the dry, of approximately equal length in the central part of the state.

Besides these great climatic differences, which have profoundly influenced the native flora, the peculiar topography of California has also been an important factor in determining the origin of many of the plants. Direct communication with the eastern half of the continent is prevented by the great mountain barrier of the Sierra, and the mountains and deserts of the Rocky mountain area. It is only on the north and south that there is free communication with the neighboring regions, and we find, in consequence, a curious mingling of northern and southern plants, with an almost complete absence of peculiarly eastern American types.

The continuous ranges of mountains extending into British Columbia and Alaska offer an easy road for many northern plants, which are equally at home in the coast ranges and Sierra Nevada, and in Canada and Alaska. With the rapid diminution in the rainfall south, most of these finally disappear, and are quite absent from the southern part of the state. Most of these northern genera, *e.g.*, Trillium, Claytonia, Erythronium, and others, are found both in Asia and northeastern America; but there are several Asiatic types which do not reach Atlantic

North America, but are restricted to the Pacific side of the continent. The genus Fritillaria is represented by a number of showy species, one of which extends as far south as San Diego; another striking instance is the western skunk cabbage, Lysichiton, a monotypic plant common to the north Pacific coasts of Asia and America.

In the valleys of the central part of the state and throughout the southern regions the plants are very different from those of the north, and have very little in common with the flora of the eastern states. Mexico and western South America are the regions which are most nearly allied in their flora to this southern district. Most of the characteristic genera of this region are either entirely absent from the Atlantic states, or else represented by very few species. Much of this area is excessively dry, and such plants as the cacti, agaves, yuccas, and other desert types give a very marked character to most of this region.

The central part of the state, especially the region about the bay of San Francisco, is a meeting-ground for the northern and southern floras. In the valleys the flora is largely composed of the southern elements. Such genera as Lupinus, Eschscholtzia, Nemophila, Orthocarpus, Brodiæa, Calochortus, Calandrinia, and other common and showy flowers of the open valleys and foothills, are represented by species either identical with the southern ones or closely allied to them. The flowers of the higher mountains, however, especially those of the moist forests of the outer coast ranges, are largely of northern origin, and these often follow the sheltered canyons down to the level of the valleys, where they mingle with the valley flora.

Probably no feature of our Pacific flora strikes the eastern botanist so forcibly as the preponderance of coniferous trees. From Sitka to San Diego, it is Conifers which give the peculiar stamp to the forests, whether at the timber line on the highest peaks, or battling with the ocean winds along the coast. It is true that in the valleys and on the lower hills groves of oaks, without accompanying Conifers, are met with; these can hardly be said to form forests, and wherever the moisture is sufficient to support a true forest growth, it is the Conifers which are the

prevailing trees. The deciduous trees which accompany them are small in comparison with their gigantic companions, and merely form an undergrowth for these.

Of the sixty or more species of Conifers found on the Pacific Coast, the larger part occur in California, which possesses more species than the whole United States east of the Rocky Mountains. An unusually large number of these are peculiar to the state and of very restricted range. Among the better known of these peculiarly Californian Conifers may be mentioned the two Sequoias, *i.e.*, the redwood and giant Sequoia; *Pinus insignis*, and *Cupressus macrocarpa*. The number of endemic angiosperms is also very large.

It is doubtful whether anywhere there are more magnificent forests than the great redwood forests of the coast range or the forest belt of the western slopes of the Sierra Nevada, where grow the great Sequoias in company with noble sugar pines and giant firs and cedars.

In this land of big things nothing has impressed me like these giant trees, the true kings of our American forests.